

FORM PTO-1449

SIXTH SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT

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2005.0020003APPLICATION NO.
09/604,097APPLICANTS
Yukio SHAKUDAFILING DATE
June 27, 2000GROUP
2828

FOREIGN PATENT DOCUMENTS

EXAMINER INITIAL		DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUB- CLASS	TRANSLATION
	AA						
	AB						
<i>7N</i>	AC40	2500319 B2	05/1996	JP			Abstract Enclosed
<i>1</i>	AD40	2556211 B2	11/1996	JP			Abstract Enclosed

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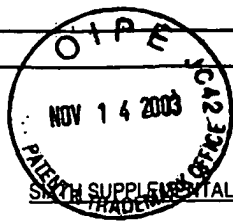
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EXAMINER INITIAL		DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUB- CLASS	TRANSLATION
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	AC41	2623466 B2	06/1997	JP			Abstract Enclosed
	AD41	2631285 B2	07/1997	JP			Abstract Enclosed

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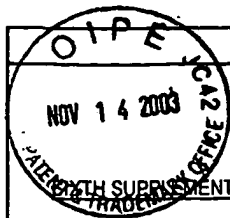
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EXAMINER INITIAL		DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUB- CLASS	TRANSLATION
TN	AA42	2631286 B2	07/1997	JP			Abstract Enclosed
	AB42	2666228 B2	10/1997	JP			Abstract Enclosed
	AC42	2728190 B2	03/1998	JP			Abstract Enclosed
	AD42	2740818 B2	04/1998	JP			Abstract Enclosed

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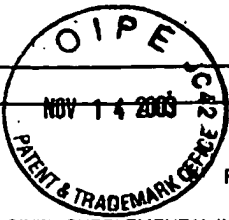
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	AB43	2751987 B2	05/1998	JP			Abstract Enclosed
	AC43	2790237 B2	08/1998	JP			Abstract Enclosed
	AD43	2812375 B2	10/1998	JP			Abstract Enclosed

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TV	AA44	2818776 B2	10/1998	JP			Abstract Enclosed
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	AC44	2829319 B2	11/1998	JP			Abstract Enclosed
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	AB45	2914014 B2	06/1999	JP			Abstract Enclosed
	AC45	2914065 B2	06/1999	JP			Abstract Enclosed
	AD45	2917742 B2	07/1999	JP			Abstract Enclosed

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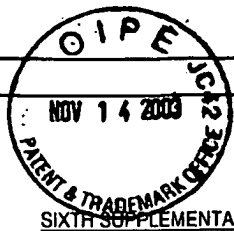
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TN	AA46	2947047 B2	09/1999	JP			Abstract Enclosed
	AB46	2982553 B2	11/1999	JP			Abstract Enclosed
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EXAMINER INITIAL		DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUB- CLASS	TRANSLATION
1 N	AA1	57-153479 A	09/1982	JP			Abstract Enclosed
	AB1	57-155793 A	09/1982	JP			Abstract Enclosed
	AC1	62-119196 A	05/1987	JP			Abstract Enclosed
	AD1	62-165948 A	07/1987	JP			Abstract Enclosed

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AE1	Ando, T., "Self-Consistent Results for a GaAs/Al _x Ga _{1-x} As Heterojunction. I. Subband Structure and Light Scattering Spectra", <i>J. Phys. Soc. Jpn.</i> 51, pp. 3893-3899 (1982).
AF1	Ando, T., "Self-Consistent Results for a GaAs/Al _x Ga _{1-x} As Heterojunction. II. Low Temperature Mobility", <i>J. Phys. Soc. Jpn.</i> 51, pp. 3900-3907 (1982).
AG1	Ando, T. and Mori, S., "Effective-Mass Theory of Semiconductor Heterojunctions and Superlattices," <i>Surf. Sci.</i> 113, pp. 124-130 (1982).
AH1	Hedin, L. and Lundqvist, B.I., "Explicit local exchange-correlation potentials," <i>J. Phys. C: Solid St. Phys.</i> , Vol. 4, pp. 2064-2082 (1971).
AI1	Ploog, K., "Molecule Beam Epitaxy of Artificially Layered III-V Semiconductors: Ultrathin-Layer (GaAs) _m (AlAs) _m Superlattices and Delta (δ-) Doping in GaAs", <i>Physica Scripta</i> , Vol. T19, pp. 136-146 (1987).
AJ1	Ploog, K., "Delta- (δ-) Doping In MBE-Grown GaAs: Concept and Device Application," <i>Journal of Crystal Growth</i> 81, North-Holland, pp. 304-313 (1987).
AK1	Ogawa, M. and Baba, T., "Heavily Si-Doped GaAs and AlAs/n-GaAs Superlattice Grown by Molecular Beam Epitaxy," <i>Japanese Journal of Applied Physics</i> , Vol. 24, No. 8, pp. L572-L574 (August 1995).

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TN	AA2	63-188977 A	08/1988	JP			Abstract Enclosed
	AB2	63-222488 A	09/1988	JP			Abstract Enclosed
	AC2	63-222489 A	09/1988	JP			Abstract Enclosed
	AD2	1-14717 B2	03/1989	JP			Abstract Enclosed

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	AE2	Sasa, S. <i>et al.</i> , "Si Atomic-Planar-Doping in GaAs Made by Molecular Beam Epitaxy," <i>Japanese Journal of Applied Physics</i> , Vol. 24, No. 8, pp. L602-L604 (August 1995).
	AF2	Yao, T. <i>et al.</i> , "The effects of substrate temperature on the donor ionization energy and on the material properties of selectively doped short-period GaAs:Si/AlAs superlattices," <i>J. Appl. Phys.</i> 62(5), American Institute of Physics, pp. 1925-1930 (September 1, 1987).
	AG2	Horikoshi, Y. <i>et al.</i> , "High-Mobility Two-Dimensional Electron Gas from Delta-Doped Asymmetric Al _x Ga _{1-x} As/GaAs/Al _x Ga _{1-x} As Quantum Wells," <i>Japanese Journal of Applied Physics</i> , Vol. 26, No. 2, pp. 263-266 (February 1987).
	AH2	Ploog, K. <i>et al.</i> , "Improved electron mobility by AlAs spacer in one-sided selectively doped Al _x Ga _{1-x} As/GaAs multiple quantum well heterostructures," <i>Appl. Phys. Lett.</i> 50(18), American Institute of Physics, pp. 1237-1239 (May 4, 1987).
	AI2	Ploog, K., "GaAs Doping Superlattices A New Class of Semiconductor Materials Grown by Molecular Beam Epitaxy," <i>Collected Paper of MBE-CST-2</i> , Tokyo, pp. 17-20 (1982).
	AJ2	Theis, T.N. and Wright, S.L., "Origin of 'residual' persistent photoconductivity in selectively doped GaAs/Al _x Ga _{1-x} As heterojunctions," <i>Appl. Phys. Lett.</i> 48 (20), American Institute of Physics, pp. 1374-1376 (May 19, 1986).
	AK2	Hiyamizu, S. <i>et al.</i> , "A New Heterostructure for 2DEG System with a Si Atomic-Planar-Doped AlAs-GaAs-AlAs Quantum Well Structure Grown by MBE," <i>Japanese Journal of Applied Physics</i> , Vol. 24, No. 6, pp. L431-L433 (June 1985).

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TN	AA3	1-204425 A	08/1989	JP			Abstract Enclosed
	AB3	2-229476 A	09/1990	JP			Abstract Enclosed
	AC3	2-291125 A	11/1990	JP			Abstract Enclosed
	AD3	3-80198 A	04/1991	JP			Abstract Enclosed

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	AE3	Baba, T. <i>et al.</i> , "AlAs/n-GaAs superlattice and its application to high-quality two-dimensional electron gas systems," <i>J. Appl. Phys.</i> 59 (2), American Institute of Physics, pp. 526-532 (January 15, 1986).
	AF3	Street, R.A. <i>et al.</i> , "Luminescence of <i>n-i-p-i</i> heterostructures," <i>Physical Review B</i> , Vol. 33, No. 10, pp. 7043-7046 (May 15, 1986).
	AG3	Schubert, E.F. and Ploog, K., "Interpretation of Capacitance-Voltage Profiles from Delta-Doped GaAs Grown by Molecular Beam Epitaxy," <i>Japanese Journal of Applied Physics</i> , Vol. 25, No. 7, pp. 966-970 (July 1986).
	AH3	Nishikawa, Y. <i>et al.</i> , "MOCVD Growth Of InGaAlP Using Ethyldimethylindium As An In Source And Application To Visible-Region Lasers," <i>Journal of Crystal Growth</i> 104, Elsevier Science Publishers B.V., pp. 245-249 (1990).
	AI3	Miller, L.M. <i>et al.</i> , "Characteristics of step-graded separate confinement quantum well lasers with direct and indirect barriers," <i>J. Appl. Phys.</i> 68 (5), American Institute of Physics, pp. 1964-1967 (September 1, 1990).
	AJ3	Sawada, T. and Majerfeld, A., "Carrier Concentration and Composition Profiling for GaAs/AlGaAs Laser Diodes," <i>Bulletin of the Faculty of Engineering, Hokkaido University</i> , No. 133, pp. 59-72 (1986).
	AK3	LePore, J.J., "An improved technique for selective etching of GaAs and Ga _{1-x} Al _x As," <i>J. Appl. Phys.</i> 51 (12), American Institute of Physics, pp. 6441-6442 (December 1980).

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	AB4	3-252176 A	11/1991	JP			Abstract Enclosed
	AC4	3-252177 A	11/1991	JP			Abstract Enclosed
	AD4	3-252178 A	11/1991	JP			Abstract Enclosed

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AE4	Sandroff, C.J. <i>et al.</i> , "Dramatic enhancement in the gain of a GaAs/AlGaAs heterostructure bipolar transistor by surface chemical passivation," <i>Appl. Phys. Lett.</i> 51 (1), American Institute of Physics, pp. 33-35 (July 6, 1987).
AF4	Takado, N. <i>et al.</i> , "Chemically enhanced focused ion beam etching of deep grooves and laser-mirror facets in GaAs under Cl ₂ gas irradiation using a fine nozzle," <i>Appl. Phys. Lett.</i> 50(26), American Institute of Physics, pp. 1891-1893 (June 29, 1987).
AG4	Ohba, Y. and Hatano, A., "H-Atom Incorporation in Mg-Doped GaN Grown by Metalorganic Chemical Vapor Deposition," <i>Jpn. J. Appl. Phys.</i> , Vol. 33, Part 2, No. 10A, pp. L1367-L1369 (October 1, 1994).
AH4	Olszakier, M. <i>et al.</i> , "Photoinduced Intersubband Absorption in Undoped Multi-Quantum-Well Structures," <i>Physical Review Letters</i> , Vol. 62, No. 25, pp. 2997-3000 (June 19, 1989).
AI4	Seilmeier, A. <i>et al.</i> , "Direct Observation of Intersubband Relaxation in Narrow Multiple Quantum Well Structures," <i>Solid-State Electronics</i> , Vol. 31, No. 3/4, Pergamon Journals Ltd., pp. 767-770 (1988).
AJ4	Yang, C. and Pan, D., "Intersubband absorption of silicon-based quantum wells for infrared imaging," <i>J. Appl. Phys.</i> 64(3), American Institute of Physics, pp. 1573-1575 (August 1, 1988).
AK4	Andersson, J.Y. and Landgren, G., "Intersubband transitions in single AlGaAs/GaAs quantum wells studied by Fourier transform infrared spectroscopy," <i>J. Appl. Phys.</i> 64(8), American Institute of Physics, pp. 4123-4127 (October 15, 1988).

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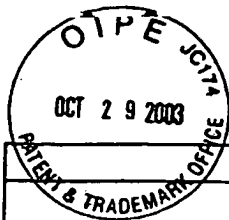
	AE5	Goldberg, B.B. <i>et al.</i> , "Inelastic Light Scattering Of Valence Subband Transitions In GaAs/GaAlAs Multiple Quantum Wells," <i>Surface Science</i> 196, Elsevier Science Publishers B.V., pp. 619-625 (1988).
	AF5	Julien, F.H. <i>et al.</i> , "Optical saturation of intersubband absorption in GaAs-Al _x Ga _{1-x} As quantum wells," <i>Appl. Phys. Lett.</i> 53(2), American Institute of Physics, pp. 116-118 (July 11, 1988).
	AG5	Goossen, K.W. <i>et al.</i> , "Conduction-band offset determination in GaAs-Al _x Ga _{1-x} As through measurement of infrared internal photoemission," <i>Physical Review B</i> , Vol. 36, No. 17, The American Physical Society, pp. 9370-9373 (December 15, 1987).
	AH5	Kastalsky, A. <i>et al.</i> , "Photovoltaic detection of infrared light in a GaAs/AlGaAs superlattice," <i>Appl. Phys. Lett.</i> 52(16), American Institute of Physics, pp. 1320-1322 (April 18, 1988).
	AI5	Bäuerle, R.J. <i>et al.</i> , "Picosecond infrared spectroscopy of hot carriers in a modulation-doped Ga _{0.47} In _{0.53} As multiple-quantum-well structure," <i>Physical Review B</i> , Vol. 38, No. 6, The American Physical Society, pp. 4307-4310 (August 15, 1988).
	AJ5	Seilmeier, A. <i>et al.</i> , "Intersubband Relaxation in GaAs-Al _x Ga _{1-x} As Quantum Well Structures Observed Directly by an Infrared Bleaching Techniques," <i>Physical Review Letters</i> , Vol. 59, No. 12, The American Physical Society, pp. 1345-1348 (September 21, 1987).
	AK5	Abstreiter, G. <i>et al.</i> , "Electronic Excitations In Narrow GaAs/Al _x Ga _{1-x} As Quantum Well Structures," <i>Surface Sciences</i> 196, Elsevier Science Publishers B.V., pp. 613-618 (1988).

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	AB6	4-164895 A	06/1992	JP			Abstract Enclosed
	AC6	4-170390 A	06/1992	JP			Abstract Enclosed
	AD6	4-247637 A	09/1992	JP			Abstract Enclosed

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AE6	Seilmeier, A. <i>et al.</i> , "Picosecond Intersubband Spectroscopy," <i>Superlattices and Microstructures</i> , Vol. 5, No. 4, Academic Press Limited, pp. 569-574 (1989).
AF6	Kane, M.J. <i>et al.</i> , "Intersubband Absorption and Infrared Modulation in GaAs/AlGaAs Single Quantum Wells," <i>Superlattices and Microstructures</i> , Vol. 5, No. 4, Academic Press Limited, pp. 587-589 (1989).
AG6	Asai, H. <i>et al.</i> , "Structure Dependence of Intersubband Absorption in InGaAs/InAlAs Multiquantum Wells," 6 pages.
AH6	Zhou, X. <i>et al.</i> , "Intersubband absorption in strained $\text{In}_{0.4}\text{Ga}_{0.6}\text{As}/\text{Al}_{0.4}\text{Ga}_{0.6}\text{As}$ ($0 < x < 0.15$) multiquantum wells," <i>Appl. Phys. Lett.</i> 54(9), American Institute of Physics, pp. 855-856 (February 27, 1989).
AI6	Rosencher, E. <i>et al.</i> , "Observation of nonlinear optical rectification at 10.6 μm in compositionally asymmetrical AlGaAs multiquantum wells," <i>Appl. Phys. Lett.</i> 55(16), American Institute of Physics, pp. 1597-1599 (October 16, 1989).
AJ6	Fejer, M.M. <i>et al.</i> , "Observation of Extremely Large Quadratic Susceptibility at 9.6–10.8 μm in Electric-Field-Biased AlGaAs Quantum Wells," <i>Physical Review Letters</i> , Vol. 62, No. 9 The American Physical Society, pp. 1041-1044 (February 27, 1989).
AK6	Walrod, D. <i>et al.</i> , "Optical nonlinearities due to subband structures in $\text{Al}_{0.08}\text{In}_{0.92}\text{Sb}/\text{InSb}$ superlattices," <i>Appl. Phys. Lett.</i> 56(3), American Institute of Physics, pp. 218-220 (January 15, 1990).

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TU	AA7	4-273175 A	09/1992	JP			Abstract Enclosed
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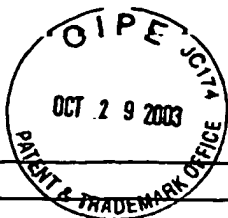
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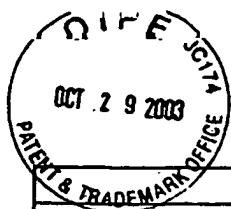
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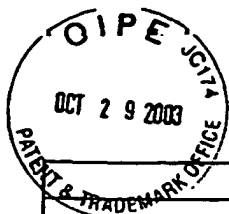
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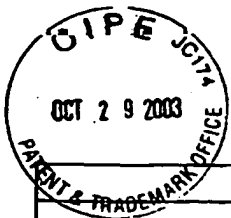
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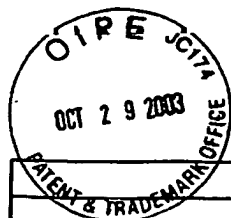
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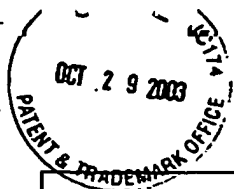
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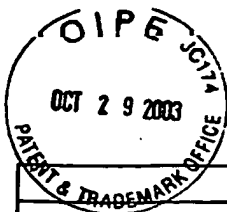
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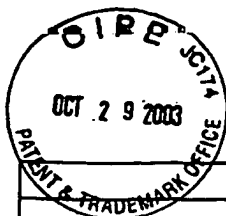
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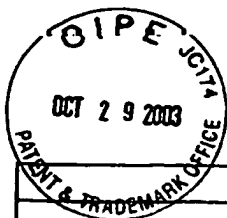
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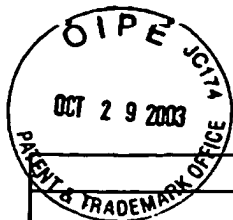
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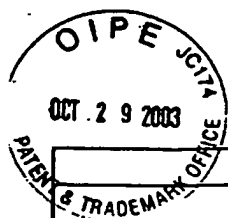
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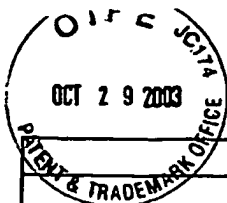
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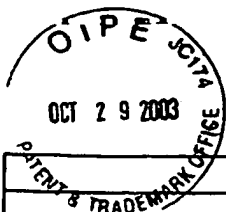
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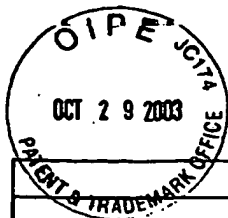
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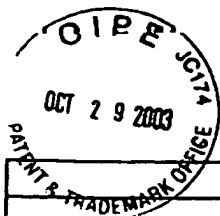
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FIFTH SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT

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Yukio SHAKUDAFILING DATE
June 27, 2000GROUP
2828

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AE36	Rowland, L.B. et al., "Aluminum nitride/silicon carbide multilayer heterostructure produced by plasma-assisted, gas-source molecular beam epitaxy," <i>Appl. Phys. Lett.</i> 62(25), American Institute of Physics, pp. 3333-3335 (June 21, 1993).
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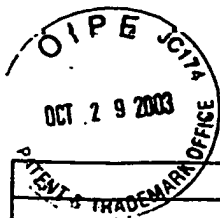
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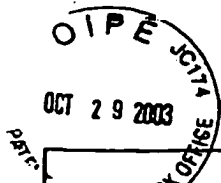
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	APPLICANTS Yukio SHAKUDA	
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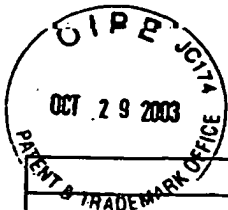
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	AF42	Nakamura, S., "In Situ Monitoring of GaN Growth Using Interference Effects," <i>Japanese Journal of Applied Physics</i> , Vol. 30, No. 8, pp. L1620-L1627 (August 1991).
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	AH43	Bulman, G.E. <i>et al.</i> , "Demonstration of a Cleaved-Facet InGaN/GaN MQW SCH Laser Grown on 6H-SiC," 2 pages.
	AI43	Trilhe, J. <i>et al.</i> , "Characterization Of The Silicon-Sapphire Interface," <i>Journal of Crystal Growth</i> 45, North-Holland Publishing Company, pp. 439-444 (1978).
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	AE44	Rubio, A. <i>et al.</i> , "Quasiparticle band structures of short-period superlattices and ordered alloys of AlN and GaN," <i>Physical Review B</i> , Vol. 49, No. 3, The American Physical Society, pp. 1952-1956 (January 15, 1994).
	AF44	Shul, R.J. <i>et al.</i> , "Plasma-Induced-Damage of GaN," <i>Electrochemical Society Proceedings</i> , Vol. 96-15, pp. 232-243.
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	AE45	Pearson, S.J. <i>et al.</i> , "Ar ⁺ -ion milling characteristics of III-V nitrides," <i>J. Appl. Phys.</i> 76(2), American Institute of Physics, pp. 1210-1215 (July 15, 1994).
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	AH45	Tojyo, T. <i>et al.</i> , "GaN-based High Power Blue-violet Laser Diodes," 5 pages.
	AI45	Koike, M. <i>et al.</i> , "RT-CW operation of GaN-based Laser Diodes improved by GaN/AlInN optical guiding lasers," 2 pages.
	AJ45	Lagerstedt, O. <i>et al.</i> , "Properties of GaN tunneling MIS light-emitting diodes," <i>J. Appl. Phys.</i> 49(5), American Institute of Physics, pp. 2953-2957 (May 1978).
	AK45	Self, K., "Prolog to Emerging Gallium Nitride Based Devices," <i>Proceedings Of The IEEE</i> , Vol. 83, No. 10, p. 1305 (October 1995).

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June 27, 2000GROUP
2828

FOREIGN PATENT DOCUMENTS

EXAMINER INITIAL		DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUB- CLASS	TRANSLATION
	AA46						
	AB46						
	AC46						
	AD46						

OTHER (Including Author, Title, Date, Pertinent Pages, etc.)

	AE46	Mohammad, S.N. <i>et al.</i> , "Emerging Gallium Nitride Based Devices," <i>Proceedings of the IEEE</i> , Vol. 83, No. 10, pp. 1306-1355 (October 1995).
	AF46	Goldenberg, B. <i>et al.</i> , "Ultraviolet and violet light-emitting GaN diodes grown by low-pressure metalorganic chemical vapor deposition," <i>Appl. Phys. Lett.</i> 62(4), American Institute of Physics, pp. 381-383 (January 25, 1993).
	AG46	Shan, W. <i>et al.</i> , "Pressure-dependent photoluminescence study of wurtzite GaN," <i>Appl. Phys. Lett.</i> 66(25), American Institute of Physics, pp. 3492-3494 (June 19, 1995).
	AH46	Wang, Y. and Mikkola, D.E., "Shock deformation of sapphire single crystals," <i>Materials Science and Engineering</i> , Elsevier Sequoia, pp. 25-32 (1991).
	AI46	Akasaki, I. And Amano, H., "High efficiency UV and blue emitting devices prepared by MOVPE and low energy electron beam irradiation treatment," <i>Proceedings of SPIE: Physical Concepts of Materials for Novel Optoelectronic Device Applications I: Materials Growth and Characterization</i> , pp. 138-149 (October 28-November 2, 1990).
	AJ46	Neugebauer, J. and Van De Walle, C.G., "Defects And Doping in GaN," pp. 2327-2330.
	AK46	Abernathy, C.R., "The Role of Hydrogen In UHV Growth of III-V Semiconductors," <i>Materials Science Forum</i> , Vols. 148-149, Trans Tech Publications, pp. 3-25 (1994).

Not Examined

EXAMINER

DATE CONSIDERED

2/27/04

EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to Applicant.

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FORM PTO-1449

ATTY. DOCKET NO.
2005.0020003APPLICATION NO.
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EXAMINER INITIAL		DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUB- CLASS	TRANSLATION
	AA47						
	AB47						
	AC47						
	AD47						

OTHER (Including Author, Title, Date, Pertinent Pages, etc.)

	AE47	Wetzel, C. <i>et al.</i> , "Excitation Spectroscopy and Level Assignment in Piezoelectric Ga _{1-x} In _x N/GaN Quantum Wells," 2 pages.
	AF47	Matsuoka, T. <i>et al.</i> , "Wide-Gap Semiconductor InGaN and InGaAlN Grown by MOVPE," <i>Journal of Electronic Materials</i> , Vol. 21, No. 2, pp. 157-163 (1992).
	AG47	Albanesi, E.A. <i>et al.</i> , "Theoretical study of the band offsets at GaN/AlN interfaces," <i>J. Vac. Sci. Technol. B</i> 12(4), American Vacuum Society, pp. 2470-2474 (July/August 1994).
	AH47	Dissanayake, A. <i>et al.</i> , "Low-temperature epitaxial growth and photoluminescence characterization of GaN," <i>Appl. Phys. Lett.</i> 65(18), American Institute of Physics, pp. 2317-2319 (October 31, 1994).
	AI47	Wickenden, D.K. <i>et al.</i> , "Thermally annealed GaN nucleation layers and the device-quality metal organic chemical vapor deposition growth of Si-doped GaN films on (00.1) sapphire," <i>J. Appl. Phys.</i> 75(11), American Institute of Physics, pp. 7585-7587 (June 1, 1994).
	AJ47	Saxler, A. <i>et al.</i> , "High quality aluminum nitride epitaxial layers grown on sapphire substrates," <i>Appl. Phys. Lett.</i> 64(3), American Institute of Physics, pp. 339-341 (January 17, 1994).
	AK47	

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